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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/530,443	04/07/2005	Julien Meunier	612.44921X00	9584

20457 7590 11/01/2006

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EXAMINER	
HUGHES, SCOTT A	
ART UNIT	**PAPER NUMBER**
3663	

DATE MAILED: 11/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/530,443	MEUNIER ET AL.	
	Examiner	Art Unit	
	Scott A. Hughes	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 April 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 April 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/7/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-6 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Independent claim 1 contains the limitation of "at least one seismic source." Claim 1 further includes the limitation of "so as to separate the respective contributions of the seismic sources to the signals received and to reconstruct the seismograms equivalent to those that would be obtained by actuating the seismic sources separately." The first limitation cited requires either a single source or a plurality of sources. The second cited limitation requires that a plurality of sources be present, and excludes the use of a single source. This contradiction in the number of required sources in the limitations of the claim does not enable one to use the invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-6 and 10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Independent claim 1 contains the limitation of "at least one seismic source." Claim 1 further includes the limitation of "so as to separate the respective contributions of the seismic sources to the signals received and to reconstruct the seismograms equivalent to those that would be obtained by actuating the seismic sources separately." The first limitation cited requires either a single source or a plurality of sources. The second cited limitation requires that a plurality of sources be present, and excludes the use of a single source. This contradiction in the number of required sources in the limitations of the claim makes the claim indefinite since it is unclear as to how many sources are required.

Claims 4-6 recite the limitation "the current spectral model." There is insufficient antecedent basis for this limitation in the claim. These claims are written as depending from claim 1, but there only a "reference spectral model" and not a "current spectral model" recited in claim 1.

Claim 10 contains the symbol h as a limitation in the claim, but there is no definition or antecedent basis for the use of this symbol in the claim. Therefore, this limitation is indefinite because it is not understood from the claim what the symbol h represents.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-10 are rejected under 35 U.S.C. 101 because the independent claims do not contain a tangible result, and therefore do not pass the "useful, concrete and tangible" test for statutory subject matter under 35 USC 101. The claims are drawn to mathematical operations involving the seismic and microseismic data. These operations could be performed by a person in their head, and therefore they are not a tangible, real world result.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gendelman (6442489) in view of Sallas (5721710).

With regard to claim 1, Gendelman discloses a method for active seismic monitoring of an underground formation allowing separation of induced microseismicity signals from seismic signals emitted within a context of active seismic monitoring of an

underground zone under development (abstract; Column 2, Lines 1-30; Column 3; Column 5, Line 37 to Column 6, Line 33). Gendelman discloses carrying out seismic recording cycles with emission of seismic waves in the formation by coupling therewith at least one seismic source which emits signals so as to form a composite vibrational signal, reception of the signals reflected by the formation in response to the emission of seismic waves, recording of the signals received by at least one seismic pickup and processing of the signal recorded (Column 2, Lines 1-20; Column 3, Lines 30-61; Column 4, Lines 14-55; Column 5, Line 37 to Column 6, Line 33). Gendelman discloses that the induced microseismicity signals are separated in the records from the seismic signals resulting from active monitoring operations, by isolating a contribution thereof by comparison with a reference spectral model by taking account of the spectral contributions of each source at the emitted fundamental frequencies emitted and at the respective harmonics thereof, and by reconstructing by inversion in the time domain the microseismicity signals (abstract; Column 2, Lines 1-30; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8). Gendelman shows the signals in the frequency domain, and it is known in the art that an inverse Fourier Transform returns the signals to the time domain. Gendelman does not disclose that the sources emit simultaneously orthogonal signals so as to form a composite vibrational signal or processing of the received signals so as to separate contributions of the seismic sources to the signals received and to reconstruct the seismograms equivalent to those that would be obtained by actuating the seismic sources separately. Sallas teaches using multiple vibrators for hydrocarbon monitoring that emit orthogonal

signals so as to form a composite vibrational signal (abstract; Column 4, Line 35 to Column 5, Line 15; Columns 11-12). Sallas teaches processing the data to reconstruct the seismograms equivalent to those that would be obtained by actuating the seismic sources separately (abstract; Column 4, Line 35 to Column 5, Line 15; Columns 11-12). It would have been obvious to modify Gendelman, who discloses the use of vibrators, to operate the separate vibrators to emit orthogonal signals and to process the obtained signals to separate the contribution of each source as taught by Sallas in order to obtain data for each vibrator-receiver path to image the formation.

With regard to claim 2, Gendelman discloses that a spectral contribution of the microseismicity signals to the spectrum of the signals received is obtained by subtracting amplitude and phase values associated with the reference spectral model from the amplitude and phase of the spectrum associated with the records (abstract; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8).

With regard to claim 3, Gendelman discloses that the reference spectral model is a current spectral model formed by updating a previous model by taking account of the spectral contribution of previous recording cycles (abstract; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8).

With regard to claim 4, as best understood by the examiner, Gendelman discloses that the current spectral is formed by determining a mean value of the frequency spectra formed from earlier or later records obtained for a same source and

same frequencies (abstract; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8).

With regard to claim 5, as best understood by the examiner, Gendelman discloses that the current spectral model is formed by determining a median value of the frequency spectra formed from earlier records obtained for the same source and the same frequencies (abstract; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8).

With regard to claim 6, as best understood by the examiner, Gendelman discloses that the current spectral model is formed by extrapolation of interpolation from the frequency spectrum from close spectral values (abstract; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8).

With regard to claim 7, Gendelman discloses a method for active seismic monitoring of an underground formation comprising discrimination of the induced microseismicity signals from among signals emitted within the context of active seismic monitoring of n underground zone under development (abstract; Column 2, Lines 1-30; Column 3; Column 5, Line 37 to Column 6, Line 33). Gendelman discloses carrying out seismic recording cycles with emission of seismic waves in the formation by coupling therewith seismic sources emitting so as to form a composite vibration signal. Gendelman discloses reception of the signals reflected by the formation in response to the emission of seismic waves, recording of the signals received by seismic reception means, and processing of the signal (Column 2, Lines 1-20; Column 3, Lines 30-61; Column 4, Lines 14-55; Column 5, Line 37 to Column 6, Line 33). Gendelman discloses

that a ratio of a contribution to a current spectral model formed by updating a previous spectral model from frequencies emitted during the previous recording and from harmonics thereof is calculated (abstract; Column 2, Lines 1-30; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8). Gendelman discloses that a part of the recording n of cycle p that can be associated with the active seismic monitoring is deduced. Gendelman discloses that a part of the recording n of cycle p relevant to the passive microseismic activity is deduced. Gendelman discloses that the seismograms that can be associated with active seismic monitoring operations are formed by inversion in a time domain of the respective spectral contributions of each seismic source at the fundamental frequencies and at harmonics thereof, after completion of a measuring cycle. Gendelman discloses that the underlying microseismic signals contained in the records are formed by inversion in the time domain from a part relevant to the passive microseismic activity (abstract; Column 2, Lines 1-30; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8). Gendelman shows the signals in the frequency domain, and it is known in the art that an inverse Fourier Transform returns the signals to the time domain. Gendelman does not disclose that the sources emit simultaneously and are controlled by orthogonal signals. Gendelman does not disclose processing the received data so as to separate the respective contributions of the seismic sources to the signals received and to reconstruct seismograms equivalent to seismograms that would be obtained by actuating the sources separately. Gendelman does not disclose that for each recording n of recording cycle p, the respective

contributions of various sources at the fundamental frequencies are calculated. Sallas teaches using multiple vibrators for hydrocarbon monitoring that emit orthogonal signals so as to form a composite vibrational signal (abstract; Column 4, Line 35 to Column 5, Line 15; Columns 11-12). Sallas teaches processing the data to reconstruct the seismograms equivalent to those that would be obtained by actuating the seismic sources separately (abstract; Column 4, Line 35 to Column 5, Line 15; Columns 11-12). It would have been obvious to modify Gendelman, who discloses the use of vibrators, to operate the separate vibrators to emit orthogonal signals and to process the obtained signals to separate the contribution of each source at the fundamental frequencies as taught by Sallas in order to obtain data for each vibrator-receiver path to image the formation.

With regard to claim 8, Gendelman discloses that the spectral contribution is obtained by multiplying a transfer function between a wavelet characteristic of the source and a seismogram associated with a receiver r, by a wavelet characteristic of a source (abstract; Column 2, Lines 1-30; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8). Gendelman discloses that the spectral contribution is obtained by a multiplication of the active and passive signals, which includes a multiplication of the wavelet characteristic of the source (source signals) and the seismograms associated with the receiver that records active and passive signals.

With regard to claim 9, Gendelman discloses that the transfer function is continuously updated (abstract; Column 2, Lines 1-30; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8). Gendelman discloses that

the passive signals are recorded before and after the active signaling, and therefore the transfer function which involves these passive signals is updated with each new acquisition of passive data.

With regard to claim 10, Gendelman discloses that updating of the transfer function is obtained during a current cycle from an estimation made during a previous cycle and from an initial estimation made during a current cycle by the relation given in the claim (abstract; Column 2, Lines 1-30; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8). Gendelman discloses that the passive signals are recorded before and after the active signaling, and therefore the transfer function which involves these passive signals is updated with each new acquisition of passive data. The updated would include an updating coefficient h relating to the change in the model between receptions of the passive signals.

Conclusion

The cited prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott A. Hughes whose telephone number is 571-272-6983. The examiner can normally be reached on M-F 9:00am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on (571) 272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SAH

JACK KEITH
SUPERVISORY PATENT EXAMINER